

demand rate for titles with variables descriptive of the teaching and research programs of the university. A sample calculation was performed indicating how this model can be employed to predict the mean yearly demand rate for titles as a function of teaching and research activities for use in planning library service. These estimates of the mean demand rate are used as input data to the models discussed in the ensuing sections.

Application of The Multiple Copy Selection Model

In the preceding section estimates were computed of the yearly demand rate for titles in each subject area. In this section these estimates are used as input to the Multiple Copy Selection Model which can be solved to aid the library in determining the optimal proportions of duplicates, triplicate, etc. copies to purchase for the new titles selected. The output of this model yields a measure of the marginal expected exposures experienced as a result of the purchase of an additional multiple copy. The criterion employed for purchasing an additional copy of a title is to do so if the expected number of exposures per unit cost experienced by this additional copy exceeds the expected number of exposures per unit cost for the expenditure of funds in alternative programs.

To implement this model, the following tasks were performed:

1. A vector of parameters was estimated relating the mean yearly demand rate for titles in each subject area, \bar{D}_i , and the mean yearly demand rate for titles in each subcollection (defined by publication date of titles) of each subject area, \bar{D}_{it} . This vector was then used to estimate the mean yearly demand for titles of a subcollection from year to year over the life of the titles.
2. The Multiple Copy Selection Model was solved to yield a matrix of values for M_{it} , the expected yearly circulation rate experienced per multiple copy in subject area i , subcollection t . M_{it} is a function of \bar{D}_{it} and w_i , the proportion of titles in subcollection t , subject area i which comprises the set of titles which experience a higher demand rate.
3. The expected number of circulations experienced by a multiple copy over its life time was determined by summing the expected yearly exposure rate over the life of the title.

$$\sum_t M_{it} = M_i, \text{ where } M_i \text{ equals the expected number of circulations over the life of the title.}$$

Let us experience per multiple copy from the time it is procured until it is discarded.

4. The value of M_i computed in (3) was used to construct a benefit-cost measure descriptive of the expected number of additional exposures per unit cost as a function of an incremental change in the level of w_i , the proportion of titles for which a multiple copy is purchased.

These tasks are described in succession.

Circulation data were collected for a period of time according to publication date of the circulated titles. From these data estimates were computed for the ratio of the number of titles circulated from each subcollection to the total number of titles circulated, G_t/G . A sample of the holdings was drawn to estimate the number of titles held within each subcollection. From these data estimates were computed for the ratio of the number of titles held in each subcollection to all titles held, N_t/N . Then for each subcollection the relative circulation rate, $P_t = G_t/G \cdot N_t/N$, was computed as developed in equation (4-30). We observe that:

$$P_t = \frac{G_t}{N_t} \cdot \frac{N}{G} = \frac{G_t}{G} \cdot \frac{N}{N_t} \quad (5.12)$$

which equals the average circulation rate per subcollection times the constant N/G . Thus, P_t represents a measure of the relative circulation rate of titles in subcollection t . These results are shown in Table 5-5. Since P_t represents a measure of the relative circulation rate by subcollections, P_t times the mean yearly circulation rate for subject area i , \bar{D}_i , yields an estimate of mean yearly circulation rate for these titles in subject area i which are t years old, \bar{D}_{it} . The accuracy of these estimates for subject areas depends upon the assumption that the value of the relative measure of popularity or intensity of use of titles as they age, P_t , is similar across subject areas. This probably is a reasonable assumption for the subject areas within a broad category such as Business.

Estimates of the mean yearly demand rate for titles in subcollection t and subject area i , \bar{D}_{it} , are obtained by multiplying the vector of P_t values times the scalar \bar{D}_i , the mean yearly demand rate for titles in subject area i . These estimates of \bar{D}_{it} are slightly biased downward when $P_t > 1$ and upward when $P_t < 1$. This bias occurs because the disparity between \bar{D}_{it} and \bar{D}_i increases disproportionately as \bar{D}_i increases and vice versa. However, as the results are to be aggregated, upward biases will compensate the

TABLE 5-5
RATIO OF THE NUMBER OF TITLES CIRCULATED WITHIN EACH SUBCOLLECTION TO ALL TITLES CIRCULATED, G_t/G , RATIO OF THE NUMBER OF TITLES HELD WITHIN EACH SUBCOLLECTION TO ALL TITLES HELD, N_t/N , AND THE RELATIVE CIRCULATION RATE, P_t

YEAR	G_t/G	N_t/N	P_t
1959	.0746	.0272	2.74
1960	.1103	.0410	2.69
1961	.0929	.0445	2.09
1962	.1011	.0407	2.48
1963	.0725	.0455	1.57
1964	.0833	.0439	1.84
1965	.0674	.0473	1.46
1966	.0674	.0410	1.53
1967	.0947	.0621	1.50
1968	.0947	.0574	.93
1969	.0235	.0295	.79
1970	.0235	.0300	.78
1971	.0163	.0277	.59
1972	.0163	.0311	.52
1973	.0153	.0293	.75
1974	.0163	.0233	.70
1975	.0163	.0241	.64
1976	.0082	.0242	.39
1977	.0092	.0165	.56
1978	.0061	.0118	.34
1979 or before	.0900	.3439	.26

downward biases in these estimates of titles to yield by the procedure to a which \bar{D}_{it} was rate at t (4-37) was values of to be computed a great in this model, to construct M_i for of M_i for To account

PROGRAM	SUBPROGRAM	ELEMENT	COMPONENT	TASK
				B. To provide user furnishings (library unit)
				1. To provide seating
				a. Desk-chairs (carrels)
				b. Table-chair combinations
				c. Lounge chairs
				2. To provide other furnishings
				II. To provide access to documents within the library
				A. To manage document collections (subject category)
				1. To select documents
				a. Selection mechanism
				b. Documents
				(1) Books (subject area)
				(2) Periodicals-serials
				(3) Other
				2. To acquire documents
				a. Ordering
				b. Receiving
				3. To classify documents
				4. To process documents

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PROGRAM	SUBPROGRAM	ELEMENT	COMPONENT	TASK
				a. Binding
				b. Numbering and pasting
				5. To weed and maintain collection
				a. Rebinding and repairs
				b. Relocating
				c. Discarding
				6. To store documents
				a. Shelving
				b. Physical area
				c. Environment
				d. Maintenance
				B. To control use and location of documents (library unit)
				1. Circulation
				2. Loans to other libraries
				3. Periodical control
				4. Reserve service
				5. Reshelving
				6. Security
				C. To facilitate document use (library unit)
				1. To provide accessory equipment
				a. Microform readers
				b. Audio equipment
				c. Visual Equipment

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PROGRAM	SUBPROGRAM	ELEMENT	COMPONENT	TASK
				2. To provide copy service
				III. To provide access to documents in other libraries
				A. To provide inter-library document loan (library)
				1. To assist users in requesting documents from other libraries
				2. To request, receive, control and return documents borrowed from other libraries
				B. To coordinate and administer inter-library access agreements (library)
				IV. To provide aids in identifying and locating documents and to provide information
				A. To provide aids to locate documents within the library (library unit)
				1. To provide catalogues
				a. Determining catalogue entries
				b. Maintaining catalogue
				2. To prepare and post directional signs and explanatory placards
				B. To provide aids to identify existing documents and to locate documents in other libraries (library unit)
				1. To manage index collection

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PROGRAM	SUBPROGRAM	ELEMENT	COMPONENT	TASK
				a. Selection
				b. Acquisition
				c. Classification and cataloguing
				d. Processing
				e. Weeding and Maintenance
				f. Storage
				2. To control use and location of indexes
				3. To facilitate index use
				C. To assist in compiling cooperative inter-library catalogues of holdings (library)
				D. To provide personal assistance for document identification and location and to provide information (library unit)
				1. To assist users in performing literature research and in identifying or verifying a specific citation
				2. To provide reference information
				V. To promote use of the library
				A. To provide publications, advertisements and exhibits (library unit)
				1. To provide publications
				a. User guides
				b. Selected bibliographies
				2. To advertise
				3. To construct exhibits

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PROGRAM	SUBPROGRAM	ELEMENT	COMPONENT	TASK
				B. To provide personal communication with members of population being served (library unit)
				1. To perform liaison visits with faculty
				2. To conduct library tours and classes regarding use of the library
				VI. To provide general administrative and support services
				A. To provide administrative service (library)
				1. To administer personnel activities
				2. To handle payments, receipts, and accounting requirements
				3. To prepare programs, projects, and budgets
				4. To administer reports
				5. To perform other administrative services as required
				B. To provide support services (library)
				1. To provide office supplies
				2. To provide copy and duplication service
				3. To provide internal mail service
				C. To provide staff area and office equipment
				1. To provide physical area
				2. To provide environment
				3. To provide maintenance
				4. To provide office equipment

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